

# Comorbid Medical Conditions, Outpatient Healthcare Resource Use, and Charges Associated with Diagnosis of Chronic Insomnia in the US

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## BACKGROUND

- Insomnia is defined as trouble initiating or maintaining sleep with daytime symptoms of impaired decision making, work performance, and quality of life.<sup>1</sup>
- Insomnia is considered chronic when persisting  $\geq 3$  times per week for  $\geq 3$  consecutive months.<sup>2</sup>
  - The prevalence of chronic insomnia is estimated as ~5-10%<sup>3,4</sup> and increases with age and comorbidity.<sup>1</sup>
- The clinical and economic burden of chronic insomnia is an emerging public health concern.
  - Chronic insomnia can adversely affect health, quality of life, productivity at work, and academic performance.<sup>5</sup>
  - It can lead to increased daytime sleepiness increase the risk of motor vehicle accidents.<sup>5</sup>
  - It is also considered a contributing risk factor for medical problems like cardiovascular diseases, chronic pain syndrome, depression, anxiety, diabetes, obesity, and asthma.<sup>5</sup>
  - The most consistent impact of insomnia has been shown to be an increase in the risk of depression.<sup>6</sup>

## OBJECTIVES

- The objectives were to:
  - Describe the clinical and financial burden among patients following a diagnosis of chronic insomnia; and
  - Assess treatment patterns for the recommended first-line treatment, cognitive behavioral therapy for insomnia (CBTi), using psychotherapy and health behavior codes as proxies.

## METHODS

### DATA SOURCE

- Allscripts medical claims and electronic medical record (EMR) data were provided by Health Verity/Veradigm for 60,000 U.S. patients with chronic insomnia and depression diagnostic codes between January 1, 2015 to December 31, 2018.
  - Medical claims data included basic demographics, diagnosis and procedure codes, and charges for outpatient encounters.
  - EMRs provided data on outpatient encounters, diagnoses and procedures, labs, and medications.

### PATIENT POPULATION

#### Inclusion Criteria

- Earliest insomnia diagnosis (ICD-9 or ICD-10 diagnosis codes for insomnia, in any diagnosis position on the claim) between 2016-2017 (first claim with diagnosis = index date);
- Presence in the dataset  $\geq 12$ -months pre-/post-index;
- $\geq 18$  years old on index date; and
- One or both of the following conditions must be met:
  - 2<sup>nd</sup> insomnia claim within 6-months of index, or
  - Sleep medication in EMR 3 months pre- or 6-months post-index.

## METHODS CONT'D

### Exclusion Criteria

- Presence of psychotic depression diagnosis 12-months pre-index or on index date.

### OUTCOME MEASURES AND ANALYSES

- The proportions of patients with comorbidity, outpatient visits (OPV), charges (adjusted to 2019 dollars with Medical Consumer Price Index [CPI]), and CBT codes (used as proxies for CBTi as there is no specific code for CBTi) were measured and compared for the 12-months pre-index (baseline) and 12-months post-index (follow-up) periods.
- Pre- and post-period OPV and charges (2019-adjusted) were compared using McNemar's tests and Wilcoxon signed-rank tests.
- A mixed model compared charges for patients with and without comorbidity.

## RESULTS

### SAMPLE SELECTION AND BASELINE DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

- The study sample consisted of 9,505 patients (median age 51 years, 73.2% female; **Table 1**).

**Table 1.** Baseline demographic and clinical characteristics

Baseline Characteristic	Value
Age at Index (years), median (IQR)	51 (41-58)
Age at Index (years), n (%)	
18-34	1266 (13.3%)
35-44	1785 (18.8%)
45-54	2951 (31.1%)
55-64	3503 (36.9%)
65+	-
Gender, n (%)	
Male	2552 (26.9%)
Female	6953 (73.2%)
Primary Payer, n (%)	
Private	7360 (77.4%)
Public	1574 (16.6%)
Other	571 (6.0%)
Census Region, n (%)	
Northeast	1389 (14.6%)
Midwest	2857 (30.1%)
South	4780 (50.3%)
West	479 (5.0%)
Year of Index Diagnosis, n (%)	
2016	5368 (56.5%)
2017	4137 (43.5%)
Eligibility, n (%)	
Through Sleep Medication Requirement Alone	4841 (50.9%)
Through 2 <sup>nd</sup> Insomnia Diagnosis Date	4664 (49.1%)
Specialty of Diagnosing Practitioner, n (%)	
Primary Care Physician (PCP)/PCP Services	4342 (45.7%)
Specialist	573 (6.0%)
N/A or Missing/Unknown	4590 (48.3%)

IQR, interquartile range; PCP, primary care physician.

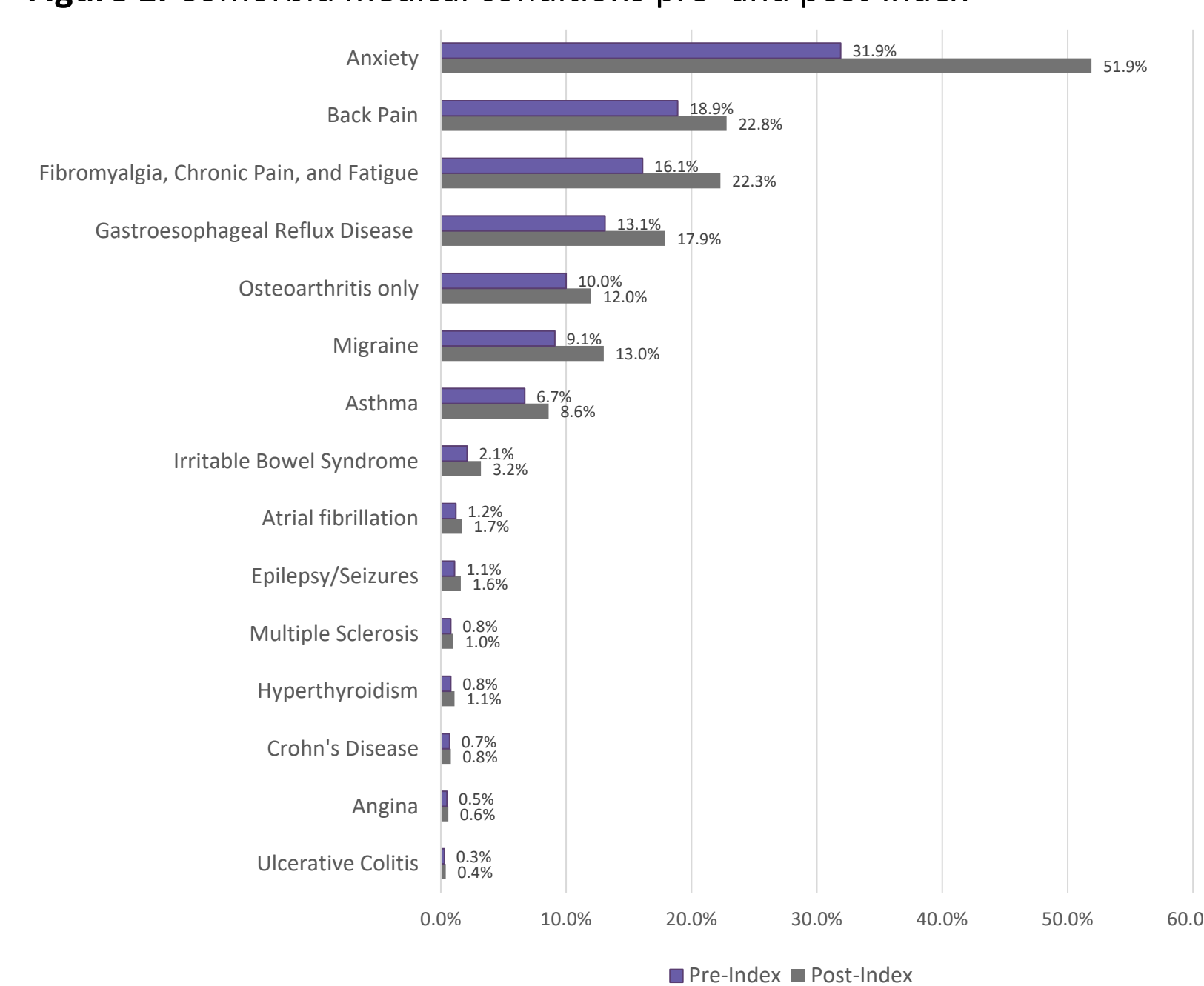
## RESULTS CONT'D

- Most patients had private health insurance (77.4%) and were from the South (50.3%) and Midwest Census regions (30.1%; **Table 1**).
- Approximately half of the patients met eligibility through the sleep medication requirement and half met it through the 2nd insomnia diagnosis (**Table 1**).
- Among patients with information regarding the specialty of the diagnosing practitioner (51.7%), most were diagnosed by a primary care physician (PCP; 45.7%; **Table 1**).

### COMORBID MEDICAL CONDITIONS

- Most common pre-index comorbidities showed increases in prevalence post-index, including (in decreasing order of relative increase): anxiety (63%), migraine (43%), depressive symptoms (39%), fibromyalgia/chronic pain/fatigue (39%), GERD (37%), back pain (21%), and osteoarthritis (19%) (**Figure 1**).

**Figure 1.** Comorbid medical conditions pre- and post-index



### HEALTHCARE RESOURCE UTILIZATION

- The mean number of OPV (office, hospital, and other) per patient increased following a diagnosis of insomnia (relative increases of 44%, 16%, and 28%, respectively; each  $p < 0.001$ ; **Table 2**).

**Table 2.** Number of outpatient visits 12-months pre- and post-index

Number of Unique Visits, mean (SD)	Pre-Index	Post-Index	P-value*
Outpatient office	5.60 (6.76)	8.07 (7.71)	<0.001
Outpatient hospital	0.43 (1.87)	0.50 (2.11)	<0.001
Outpatient other	0.32 (1.50)	0.41 (1.81)	<0.001

\*Based on the Wilcoxon signed-rank test  
ER, emergency room; SD, standard deviation

## RESULTS CONT'D

### CHARGES

- Median 12-months charges per patient increased by \$472 ( $p < 0.001$ ) for OPV office but not OPV hospital/other visits (**Table 3**).

**Table 3.** Outpatient charges 12-months pre- and post-index

Outpatient Charges, median (IQR)	n	Pre-Index	Post-Index	P-value*
Total	8639	\$1252 (\$595-\$2659)	\$1748 (\$966-\$3383)	<0.001
Office visits	8342	\$1117 (\$553-\$2208)	\$1589 (\$902-\$2901)	<0.001
Outpatient hospital visits	683	\$1051 (\$373-\$2498)	\$948 (\$335-\$2382)	0.566
Other outpatient visits	570	\$703 (\$314-\$1755)	\$803 (\$355-\$1879)	0.057

\*Based on the Wilcoxon signed-rank test  
IQR, interquartile range.

- Median post-index charges were higher for all OPV among patients with Charlson Comorbidity Index (CCI)  $\geq 1$  (\$2435) vs CCI=0 (\$1384) ( $p < 0.001$ ); both groups experienced a similar post-index increase in median charges (37.2% vs 34.6%; **Table 4**).

**Table 4.** Outpatient charges 12-months post-index by CCI score

Outpatient Charges, median (IQR)	CCI Score = 0	CCI Score $\geq 1$	P-value*
Total	\$1384 (\$788-\$2588)	\$2435 (\$1308-\$4611)	<0.001
Office visits	\$1285 (\$747-\$2277)	\$2093 (\$1192-\$3733)	<0.001
Outpatient hospital visits	\$773 (\$289-\$1698)	\$969 (\$389-\$2262)	<0.001
Other outpatient visits	\$647 (\$271-\$1491)	\$806 (\$323-\$2020)	<0.001

\*Based on the Wilcoxon-Mann-Whitney test  
CCI, Charlson Comorbidity Index; IQR, interquartile range

- Total charges across all resource categories increased from 12-months pre- to 12-months post-index for patients with a CCI score of 0 and for patients with CCI score of  $\geq 1$  ( $p < 0.001$ ; **Table 5**).
- Total charges 12-months pre-index and total charges 12-months post-index were greater for patients with CCI score  $\geq 1$  compared to patients with a CCI score of 0 ( $p < 0.001$ ; **Table 5**).

**Table 5.** Total charges across all resource categories 12-months pre- and post-index by CCI score

Total Charges, median (IQR)	CCI Score = 0	CCI Score $\geq 1$	P-value*
Total	\$1049 (\$516-\$2258)	\$1873 (\$877-\$4268)	<0.001
Office visits	\$1412 (\$804-\$2668)	\$2570 (\$1363-\$5210)	<0.001
Outpatient hospital visits	<0.001	<0.001	<0.001

\*Based on the Wilcoxon-Mann-Whitney test  
CCI, Charlson Comorbidity Index; IQR, interquartile range

- CBT codes were used in 5.5% of patients (n=526) 12-months post-index.
- CCI scores (0.70 vs 0.53) and total charges 12-months post-index (\$4381 vs \$2085) were higher compared to non-CBT patients (**Table 6**).

**Table 6.** Total charges across all resource categories 12-months pre- and post-index by CBT use

Total Charges, median (IQR)	No CBT*	CBT*
12-months Pre-Index	\$1287 (\$605-\$2899)	\$1680 (\$921-\$3248)
12-months Post-Index	\$2085 (\$823-\$4900)	\$4381 (\$2431-\$8615)

\*CBT was not specific for insomnia  
CBT, cognitive behavioral therapy; IQR, interquartile range

## DISCUSSION

- This retrospective database analysis provides real-world evidence of the burden of illness among individuals diagnosed with chronic insomnia and using outpatient healthcare in the US.
- Chronic insomnia patients experienced increased comorbidity, OPV and charges following diagnosis; charges increased regardless of comorbidity.
- Proxy measures indicate that CBT of any kind is infrequently used and is more likely delivered to patients with greater comorbidity, suggesting significant unmet need.
- CBTi seems to be more prevalent among patients with more comorbid conditions and with higher overall outpatient costs, indicating that it may not be used as first-line therapy as recommended by current practice guidelines.
- Further research is needed to determine if these trends in high presence of comorbidity, underuse of CBT, and increased financial burden persist among patients diagnosed with chronic insomnia and using inpatient healthcare in the US.

## LIMITATIONS

- Inpatient and emergency department medical claims data and pharmacy claims data on filled prescriptions were not available for the acquired Veradigm dataset, which restricted evaluations of healthcare resource use and charges to outpatient care settings only.
- Pharmacy prescription data was available using only the Allscripts EMR (i.e., prescription orders), which restricted evaluations of pharmaceutical charges.
- Financial burden assessments were limited to charge data only as cost data were not available in the Veradigm medical claims data.

## CONCLUSIONS

- In this analysis, a diagnosis of chronic insomnia is associated with an increased clinical and economic burden.
- Outpatient charges increased by approximately 35%, regardless of the presence of comorbid conditions.
- Despite recommendations of use as first-line therapy for chronic insomnia, CBTi was used in only a small minority of patients, as evidenced by the limited use of CBT of any kind in this analysis.
- Evidence generated from claims and EMR datasets can be utilized to better understand real-world practice patterns and interactions that patients with chronic insomnia have with the healthcare system.

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